



Southeast Asia Composition, Cloud, Climate Coupling Regional Study (SEAC⁴RS) Research Aircraft Instrument Payloads



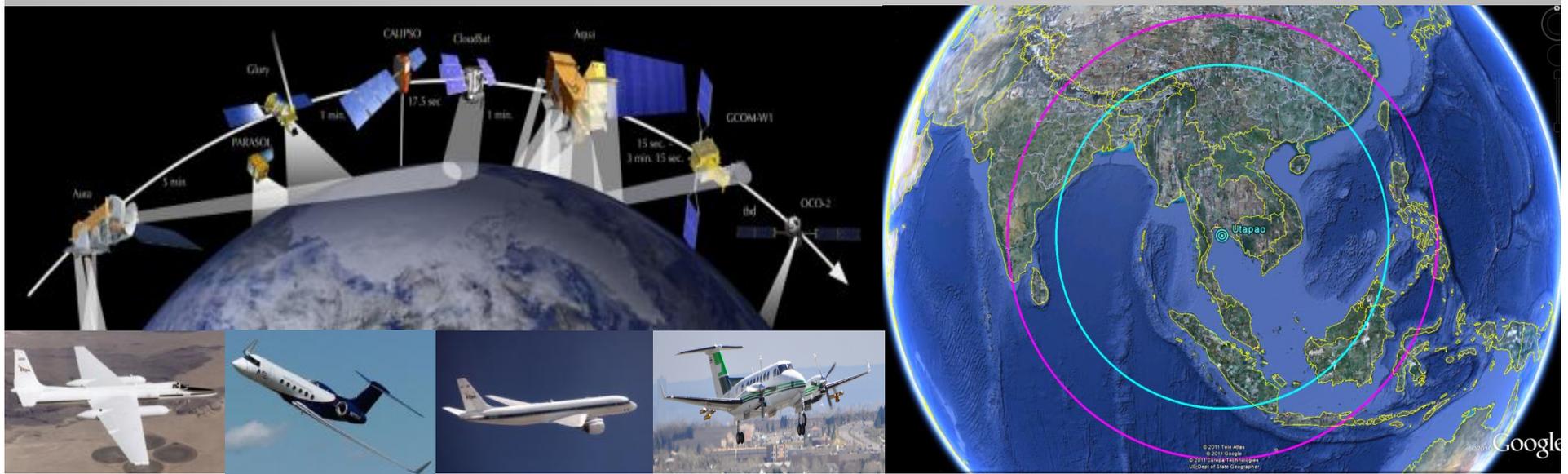
A NASA / NSF / NRL airborne field campaign focusing on atmospheric composition, chemistry, and climate over Southeast Asia.



Research Aircraft Instrument Payloads for the NASA ER-2, NSF Gulfstream V, NASA DC-8, and BRRAA King Air 350

Anticipated deployment period: **August - September 2012**

<http://espo.nasa.gov/missions/seac4rs>



Aircraft Platforms



NASA ER-2: Upper Troposphere to Lower Stratosphere

- Cruise altitude 18-21 km, range 3000 nmi, endurance 8-10 h
- Payload: Emphasis on remote sensing of aerosols and radiation with capability to observe basic chemical tracers



NSF/NCAR GV: Mid-to-Upper Troposphere

- Ceiling 14 km, range 4000 nmi, endurance 8-10 h
- Payload: Emphasis on detailed atmospheric composition and photochemistry for gases and aerosols as well as cloud microphysics



NASA DC-8: Surface to Upper Troposphere

- Ceiling 12 km, range 4000 nmi, endurance 8-10 h
- Payload: Emphasis on detailed atmospheric composition and photochemistry for gases and aerosols, detailed radiation measurements, and remote sensing of ozone and aerosols



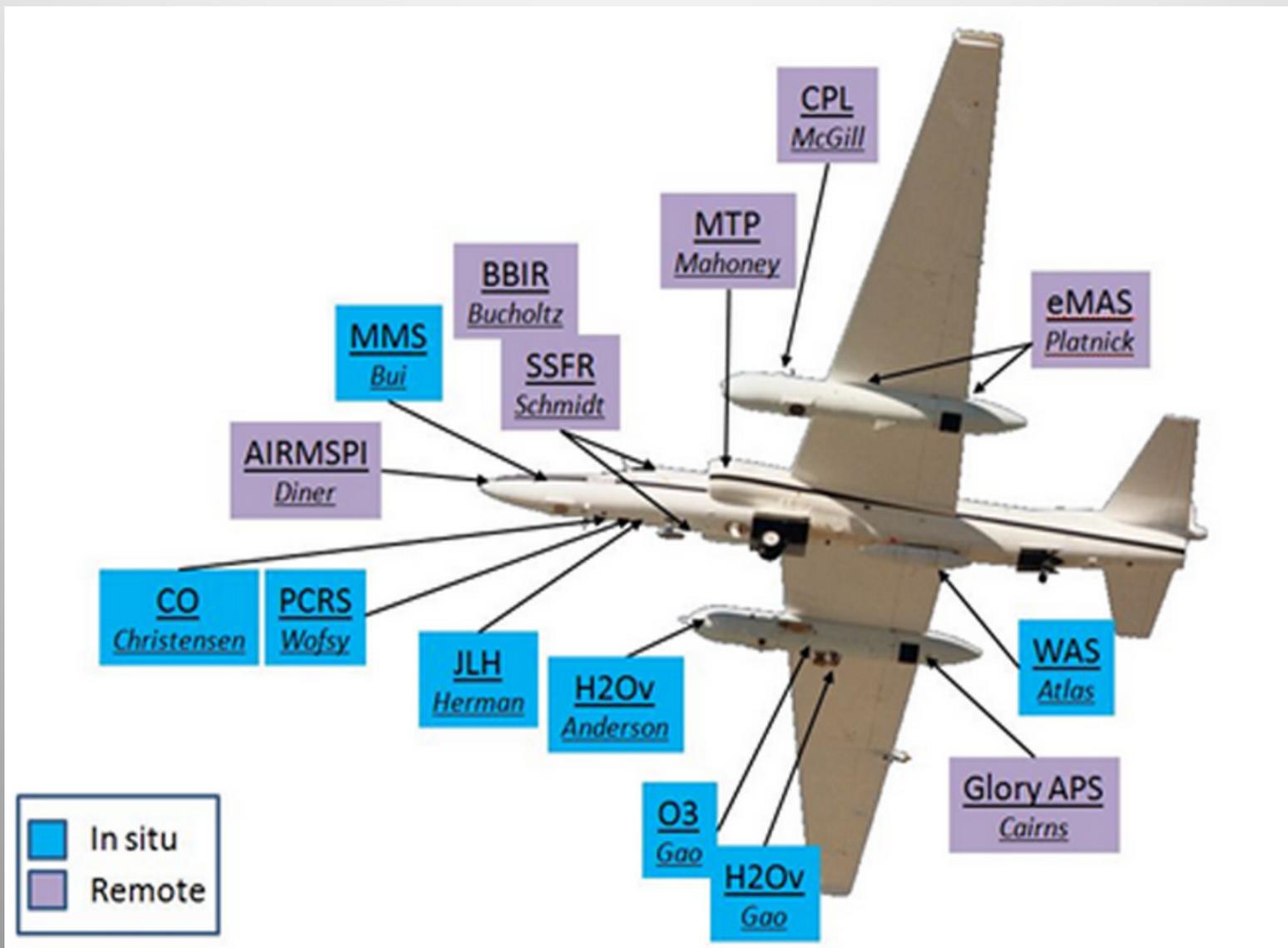
BRRAA King Air 350: Surface to Upper Troposphere

- Ceiling 10 km, range 1700 nmi, endurance 6 h
- Payload: Emphasis on in-situ measurements of cloud particle concentration and microphysics as well as aerosol and cloud condensation nucleus concentration and microphysics

ER-2 SEAC4RS Payload (14 Experiments)

Investigator (Institution)	Acronym	Measurement	Type	Method, sensitivity, resolution
Christensen (JPL)	ALIAS	CO, CH ₄ , N ₂ O	In Situ	TDL-spectroscopy, 0.1-0.3 ppb, 1 sec
Wofsy (Harvard)	HUPCRS	CO ₂ , CH ₄ , CO	In Situ	CRDS, (50, 0.2, 7 ppb), 3 sec
Herman (JPL)	JLH	Water vapor	In Situ	TDL-spectroscopy, <1 ppm, 20 Hz
Anderson (Harvard)	HHH	Water Vapor	In Situ	Fluorescence, TDL-spectroscopy, <1 ppm, 1 sec
Gao (NOAA)	UAS Ozone, Water Vapor	Ozone, Water vapor	In Situ	Ozone: Absorption, ~1 ppb, 1 sec Water Vapor: TDL, 0.5 ppm, 1 sec
Atlas (Miami)	WAS	Trace gases, VOC, OVOC, CFC, etc.	In Situ	Gas chromatography, few ppt, seconds to minutes
Mahoney (JPL)	MTP	Temperature profile	Remote	Passive Microwave radiometer, <1 K, ~20 sec
Bui (Ames)	MMS	P,T, Winds, turbulence, position, attitude	In Situ	Air motion, INS, 0.3 mb, 0.3 K, 1 m/s, 20 Hz (300 Hz turbulence)
Schmidt (Colorado)	SSFR	Spectral Irradiance	Remote	Nadir/Zenith Spectrometers, 350-2150 nm, 1 Hz
Bucholtz (NRL)	BBIR	Solar and IR irradiance	Remote	Nadir/Zenith broad-band radiometers
McGill (GSFC)	CPL	Aerosol/cloud backscatter, depolarization profiles	Remote	Multiwavelength (355, 532, 1064 nm) lidar, 1 sec, 30 m vertical
Platnick (GSFC)	eMAS	Multiwavelength reflectance imagery, cloud retrievals	Remote	Multiwavelength spectrometer
Diner (JPL)	airMSPI	Polarization and radiance imagery	Remote	Multiwavelength, multiangle polarimeter, 10 m resolution, 11 km swath width
Cairns (GISS)	RSP	Multiwavelength polarized radiances, aerosol and cloud properties	Remote	Multiwavelength, multiangle polarimeter

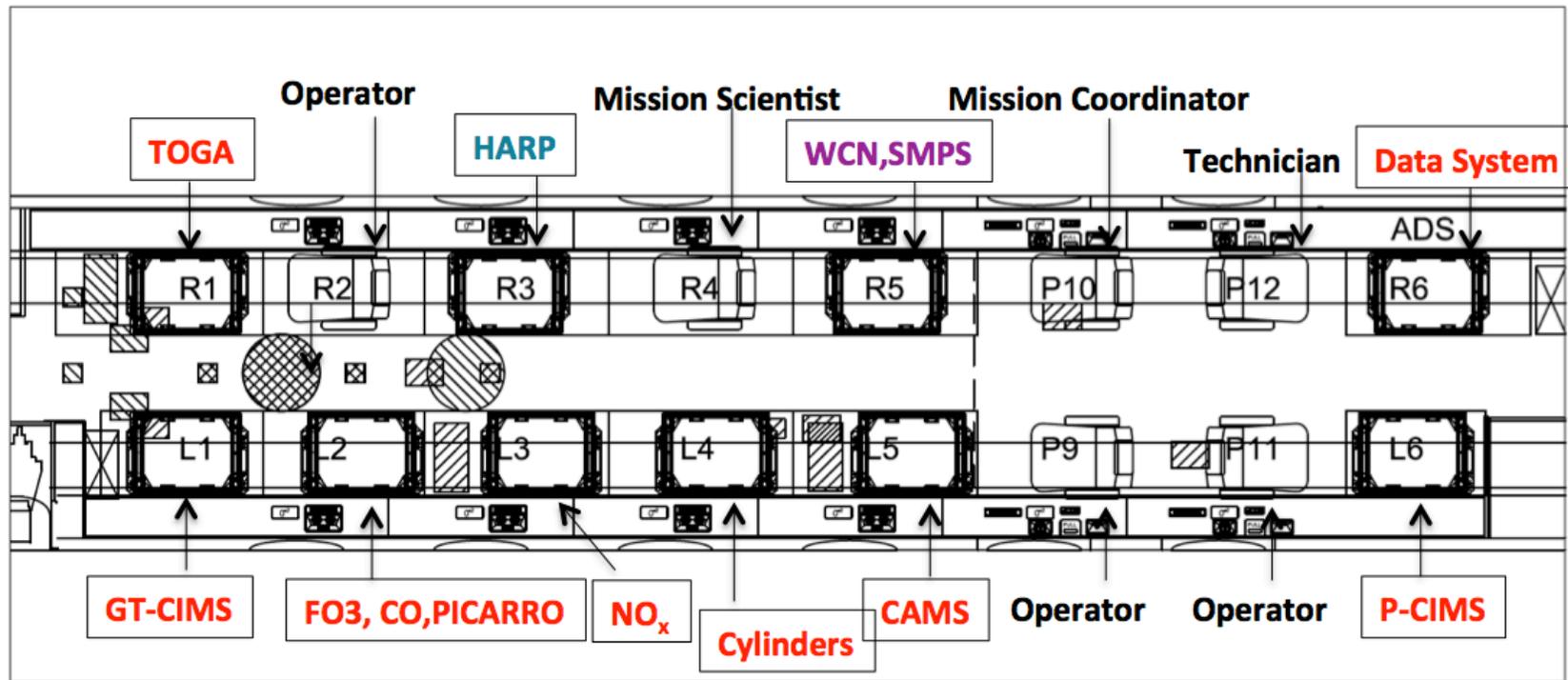
ER-2 SEAC4RS Payload



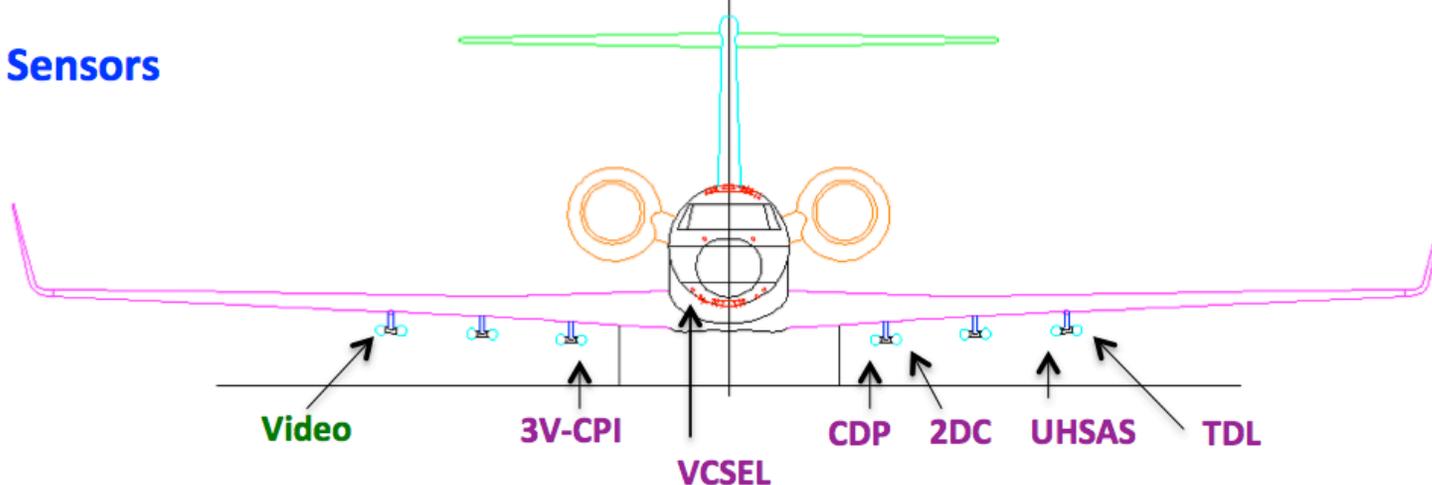
GV SEAC4RS Payload Table

Investigator/Institution	Instrument	Measurements	Method, data rate, resolution
State parameters			
Schanot/NCAR RAF	State Parameters	Lat/Lon, P, T, 3D wind	Various, 1-25 Hz
Beaton/NCAR RAF	Digital Video	forward view	Digital video
Microphysics			
Rogers/NCAR RAF	CDP	cloud hydrometeors	Spectrometer, 1 Hz, 2 - 50 μm ,
Rogers/NCAR RAF	2D-C	cloud hydrometeors	Particle Imaging, 1 Hz, 25-1600 μm ,
Jensen/NCAR RAF	3V-CPI	cloud hydrometeors	Particle Imaging, 1Hz, 2.3 μm
Rogers/NCAR RAF	UHSAS	aerosols	Spectrometer, 1-10 Hz, 0.075 - 1 μm ,
Rogers/NCAR RAF	WCN	aerosols	Optical counter, 0.01 - 3 μm ,
Smith/NCAR ACD	SMPS	aerosol size distributions	Scanning Mobility Particle Sizer, 60 s
Avallone/CU	Total Water TDL	total water	Closed-path Laser Hygrometer, 1 Hz, 10%
Zondlo/Princeton	VCSEL	water vapor	Laser Hygrometer, 1-25 Hz
Chemistry			
Weinheimer/NCAR ACD	NO _x	NO, NO ₂	Chemiluminescence, 1 Hz
Weinheimer/NCAR ACD	Fast Ozone	O ₃	Chemiluminescence, 1-5 Hz
Campos/NCAR ACD	VUV CO	CO	Vacuum UV resonance fluorescence, 1 Hz
Flocke/NCAR ACD	Picarro	CO ₂ , CH ₄	Spectroscopy, 1-5 Hz
Apel/NCAR ACD	TOGA	NMHCs, OVOCs	Gas chromatograph/mass spectrometer, 1-3 min.
Huey/GT	GT-CIMS	HNO ₃ , HNO ₄ , SO ₂ , HCl	Chemical Ionization Mass Spectrometer, 1-2 Hz
Heikes/URI	P-CIMS	H ₂ O ₂ , CH ₃ OOH	Chemical Ionization Mass Spectrometer, 1-10 Hz
Fried/NCAR EOL	CAMS	H ₂ CO, HCOOH	Spectrometer, 1 Hz
Radiation			
Hall /NCAR ACD	HARP	spectral actinic flux, spectral irradiance	Spectroradiometers, 1 Hz

GV SEAC4RS Payload Cabin Layout



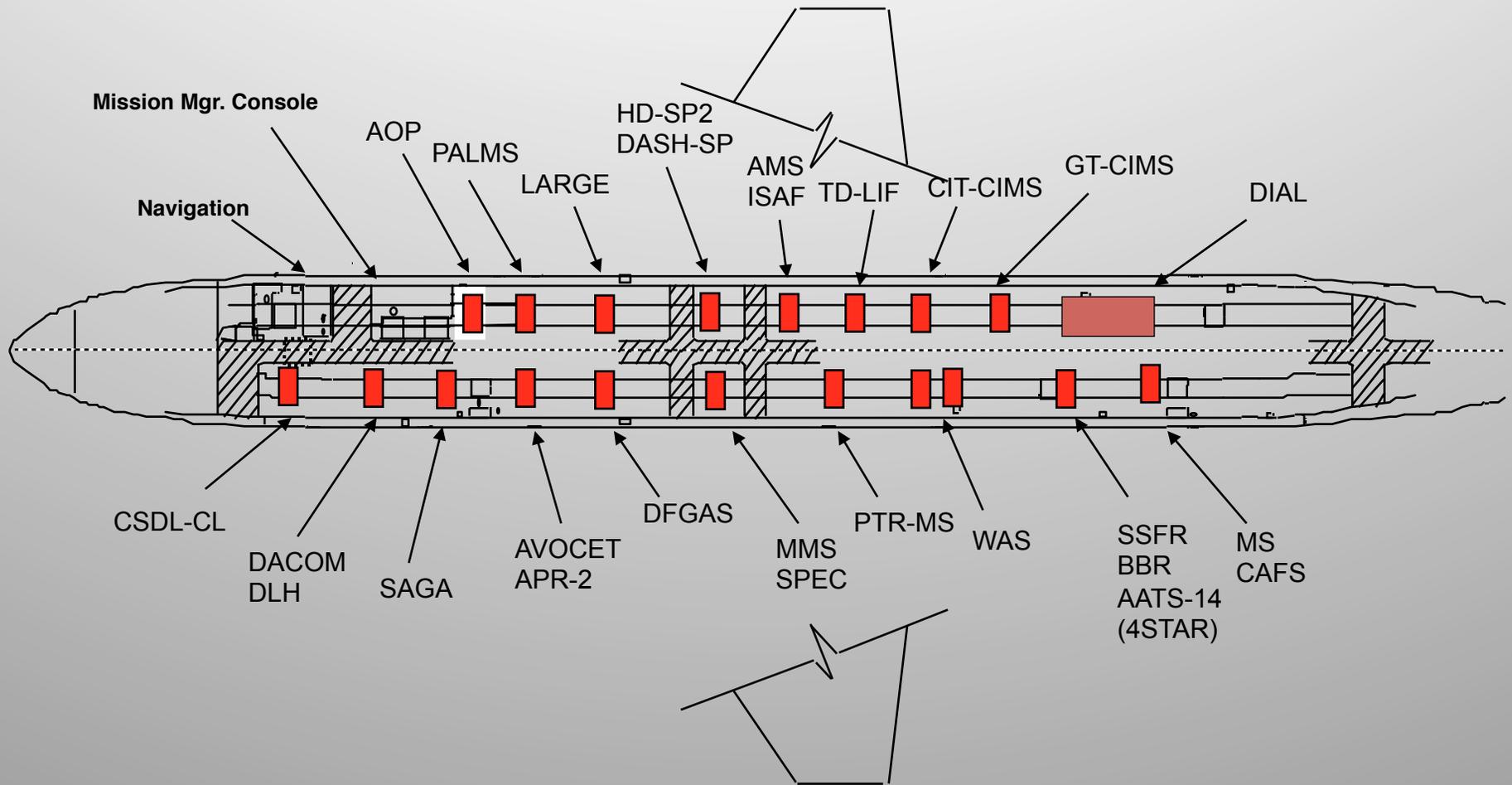
Wing Pod Sensors



DC-8 SEAC4RS Payload (26 instruments)

Investigator	Acronym	Measurement	Type	Principal, sensitivity, resolution
Ryerson	CSD CL	NO, NO ₂ , NO _y , O ₃	In Situ	chemiluminescence; 10 ppt; 1-s
Cohen	TD-LIF	NO ₂ , Sum-Nitrates	In Situ	Fluorescence; 10 ppt; 1-s
Huey	GT-CIMS	PANs, SO ₂	In Situ	Ionization-spectroscopy; 10 ppt; 10-s
Dibb	SAGA*	HNO ₃ , bulk aerosols	In Situ	Ion-chromatography; 10 ppt; 120-s
Wennberg	CIT-CIMS	HNO ₃ , HCN, peroxides, o-acids	In Situ	Ionization-spectroscopy; 10 ppt, 1-s
Fried	DFGAS	Formaldehyde	In Situ	IR-Spectrometer; 10 ppt; 15-s
Hanisco	ISAF	Formaldehyde	In Situ	Fluorescence; 10 ppt; 1-s
Wisthaler	PTR-MS	Select OVOC, NMHC, CH ₃ CN	In Situ	Ionization-spectroscopy; 10 ppt, 10-s
Blake	WAS*	Hydro and halo carbons	In Situ	Gas-chromatography; low ppt, 120-s
Diskin	DACOM	CO, CH ₄ , N ₂ O	In Situ	TDL-spectroscopy, low ppb, 1-s
Beyersdorf	AVOCET	CO ₂	In Situ	Non-dispersive IR, 100 ppb, 1-s
Diskin	DLH	Water vapor	Remote	Open-path Spectroscopy, 1 ppm, 1-s
Hair	DIAL HSRL	O ₃ and aerosol profiles	Remote	Up/down lidar ozone and aerosol profiles
Jimenez	AMS	TOF-Aerosol mass spectra	In Situ	Fine aerosol (SO ₄ /NO ₃), 0.1 ng/m ³ , 10-s
Gao	HD-SP2	Black carbon aerosol	In Situ	laser-induced incandescence, 1 ng/m ³ , 1-s
Froyd	PALMS	Single particle composition	In Situ	ionization mass spectrometer, 0.2-3 μm, 100-Hz
Anderson	LARGE	Aerosol measurements (CN, CCN)	In Situ	Particle counters, 0.01-10 μm, 1-s
Sorooshian	DASH-SP	Aerosol hygroscopicity	In Situ	Differential mobility, growth factors, 10-2500 nm
Brock	AOP	Aerosol extinction and absorption	In Situ	Cavity ring down/photoacoustic, 405-660 nm
Lawson	SPEC	Aerosol parameters	Remote	Particle imaging
Tanelli	APR-2	Precipitation, clouds	Remote	13.4 & 35.6 GHz RADAR
Russell	AATS-14	Aerosol optical depth	Remote	Sun photometer, 350-2100 nm; 2-6 nm resolution
Bucholtz	BBR	Broadband solar and IR	Remote	Up/down solar/IR irradiance, hemispheric, 10-Hz
Schmidt	SSFR	Solar and near IR irradiance	Remote	Up/down radiometer, 380-2200 nm, 10 nm resol.
Hall	CAFS	Actinic flux	Remote	Spectral radiometers, 280-680 nm, 2 nm resol.
Bui	MMS	Micromet (T, P, wind vectors)	In Situ	Winds, temperature, pressure, 100-Hz

DC-8 SEAC4RS Payload



Thai BRRAA Super King Air 350

King Air Super 350	Max TAS: 280 Kts	Max Ceiling: 35,000 ft	Endurance: 6 hours
	Instrument	Measurement	Specifications
State Parameters			
	State Parameters	Lat/Lon, P, T, Td, 3D Wind	
	Digital Video	Forward View	Hi-Res Wide Angle Color
Microphysics			
	CPI V2.5	Particle Imaging	2.3um/pixel, 8-bit gray, 400fps
	Fast FSSP	Cloud Hydrometeors	1 – 50 um, Particle Statistics
	2D-S	Cloud Hydrometeors	2 Channels: 10 – 1280 um
	HVPS	Cloud Hydrometeors	150 – 19200 um
	Nevzorov LWC/TWC	0.05 – 3 g m ⁻³	Hot wire and Deep Cone
Aerosols			
	PCASP	Aerosols	0.1 – 3 um
	CCN Counter	Aerosols	Single column, 20 bins
	SEMS/DMA	Aerosols	10 – 2500 nm

Thai BRRAA Super King Air 350

